

What is Claimed is:

1. A combination gravimetric and volumetric fluid dispensing system comprising:

a scale, the scale linked to a controller,

the controller linked to a plurality of two stage valves and a plurality of nutating pumps,

a plurality of base reservoirs housing base materials, each base reservoir being connected to one of the two-stage valves and vice versa.,

a plurality of additive reservoirs housing additives, each additive reservoir being connected to one of the nutating pumps and vice versa,

a manifold for accommodating each two stage valve and a plurality of nozzles, each nozzle being connected to one of the nutating pumps and vice versa,

wherein the base materials are dispensed sequentially and gravimetrically using signals from the scale to the controller and from the controller to the two stage valves and,

wherein the additives are dispensed volumetrically by controlling the nutating pumps with the controller.

2. The dispensing system of claim 1 further comprising a plurality of base pumps, with each base reservoir being connected to one of the base pumps and vice versa for delivering each base material to its respective two stage valve under pressure.

3. The dispensing system of claim 2 further comprising a proportional control linked to the controller and each of the base pumps, the controller sending signals to the proportional control for controlling the output from each base pump.

4. The dispensing system of claim 3 wherein the controller sends signals to the proportional control to increase or decrease the output of one of the base pumps in response to signals received at the controller from the scale indicating the amount of a particular base material that has passed through its respective two step valve.

5. The dispensing system of claim 1 wherein with each base reservoir houses a different base material.

6. The dispensing system of claim 1 wherein each additive reservoir housing a different additive.

7. The dispensing system of claim 1 wherein the two stage valves are connected concentrically to the manifold and an outlet of each of said two stage valves is directed downward and toward a central axis around which the two stage valves are mounted to the manifold.

8. The dispensing system of claim 7 wherein the manifold comprises a central opening disposed along the central axis, the central opening receiving an orifice block comprising a plurality of orifices, each orifice accommodating a nozzle, each nozzle being connected to one of the nutating pumps and vice versa.

9. The dispensing system of claim 1 wherein the scale comprises a horizontal surface for supporting a container to be filled with base materials and additives, the horizontal surface comprising indicia for centering containers of different sizes under the manifold.

10. The dispensing system of claim 1 wherein each two step valve comprises:

a cylinder comprising a first end connected to an outlet port and a second end connected to an actuator with an inlet port disposed therebetween and which is connected to its respective base reservoir,

the actuator being connected to a first end of a rod that has a second end that serves as a low flow plug,

the rod slidably passing through a first spring disposed between the actuator and the low flow plug,

the rod also slidably passing through a first sleeve disposed between the first spring and the low flow plug,

a first end of the first sleeve engaging the first spring and a second end of the first sleeve engaging a second spring, the second end of the first sleeve also being connected to a second sleeve,

the second sleeve connecting the first sleeve to an annular high flow plug,

the second spring being trapped between the first sleeve and a fixed annular retainer,

the rod also slidably passing through the second spring and second sleeve and passing through the fixed annular retainer but being fixedly connected thereto,

the annular retainer comprising a first end directed towards the second end of the first sleeve and a second end that supports the second spring,

wherein, in a closed position, the first spring biases the low flow plug of the rod and the annular high flow plug into a sealing engagement with the outlet port by way of biasing pressure of the first spring against the first sleeve,

to move from the closed position to a low flow position, the actuator pulls the rod away from the outlet port thereby causing the first end of the annular retainer to move towards the first sleeve and moving the low flow plug portion of the rod out of sealing engagement with the annular high flow plug,

to move the low flow position to a high flow position, the actuator continues to move the rod away from the outlet port so that the first end of the annular retainer engages the second end of the first sleeve thereby causing the first sleeve to pull the second sleeve and the high flow annular plug away from the outlet port by overcoming the bias of the first spring.

11. The dispensing system of claim 10 wherein from the high flow position the two step valve is closed by moving back to the low flow position before the closed position.

12. The dispensing system of claim 1 wherein the base reservoirs are located remotely from manifold by a distance of greater than 15 ft while the nutating pumps are disposed within 10 ft of the manifold.

13. The dispensing system of claim 1 wherein the dispensing system comprises at least 5 base reservoirs and at least 5 two stage valve and at least 10 additive reservoirs and at least 10 nutating pumps.

14. The dispensing system of claim 1 wherein the base materials are base materials for paint and the additives are colorants for paint and the dispensing system is a paint dispenser.

15. A method for dispensing a paint formula comprising a plurality of base materials and a plurality of colorants into a container using a single dispensing apparatus, the method comprising:

- placing a container on a scale,
- dispensing one or more base materials into the container by weight;
- dispensing the colorants into the container by volume;
- dispensing any remaining base materials into the container by weight.

16. The method of claim 15 wherein the dispensing of the base materials and additives is carried out with the dispensing system of claim 1.

17. The method of claim 15 wherein the one or more additional ingredients are added to the container by hand.

18. A method for dispensing a liquid formula comprising a plurality of liquid base materials and a plurality of liquid additives into a container using a single dispensing apparatus, the method comprising:

- placing a container on a scale,
- dispensing one or more base materials into the container by weight,
- dispensing the additive materials into the container by volume,
- dispensing any remaining base materials into the container by weight.

19. The method of claim 18 wherein the dispensing of the base materials and additives is carried out with the dispensing system of claim 1.

20. The method of claim 18 wherein the one or more additional ingredients are added to the container by hand.